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e Price of White Pine Stumpage and Lumber During The Movement of New Hampshire Sawmills Into and Out of Production

By Michael R. C. Massie

and

Oliver P. Wallace

Station Bulletin 480

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The material in this bulletin is taken from a thesis submitted by Mr. Massie to the University of New Hampshire in partial fulfillment for the degree of Master of Science in Forestry.

DECEMBER, 1963

TABLE OF CONTENTS

	Page
LIST OF TABLES	2
LIST OF FIGURES	3
SUMMARY	4
A PROBLEM	5
REVIEW OF LITERATURE	5
Sawmill changes	5
Decline of lumber production	6
Lumber price and quality	7
Industry readjustment	7
DETERMINATION OF SAWMILL MOVEMENT	8
Sawmill population	8
Dependency upon white pine stumpage	10
CHANGES IN SAWMILL PRODUCTION	12
PRICE RELATIONSHIPS	13
Stumpage price	13
Wholesale price indexes	13
Wholesale prices of white pine lumber	14
Wholesale price indexes for white pine lumber	15
Wholesale prices and wholesale price indexes, adjusted	16
RESULTS	18
Sawmill movement	18
Sawmill size	18
Lumber price	21
CONCLUSIONS	26
Sawmill movement and size	26
The margin between stumpage and lumber prices	26

LIST OF TABLES

Table		Page
1.	Sawmill Population in New Hampshire, 1947-1961	9
2.	Sawmill Population in New Hampshire with Registered Sawmills and Mills Representing The Annual Cut, 1946-1961	10
3.	Buyers of Forest Products, 1947-1961	10
4.	Number of Sawmills Purchasing Hardwood and Softwood Logs, 1946-1961	11
5.	Annual Cut of Lumber by all New Hampshire Mills in M b.f., 1946-1960	11
6.	Number of Sawmills Purchasing Logs and Stumpage, 1946-1961	12
7.	Average Volume Cut per Mill in M b.f., 1946-1960	13
8.	Price and Price Index for White Pine Stumpage in New Hampshire in Dollars per M b.f., 1946-1961	14
9.	Wholesale Price Indexes (1947-1949 = 100), 1946-1961	14
10.	Wholesale Prices of White Pine Lumber by Size and Grade per M b.f., 1946-1961	15
11.	Wholesale Price Indexes of White Pine Lumber by Size and Grade per M b.f., 1946-1961	17
12.	Wholesale Prices and Indexes Adjusted to Quality of Stumpage per M b.f., 1946-1961	17

LIST OF FIGURES

Figure		Page
1.	Sawmill Population in New Hampshire, 1947-1961	18
2.	Movement of Sawmills in New Hampshire Into and Out of Production, 1947-48 to 1961	19
3.	Total Annual Cut of Lumber for New Hampshire, 1946-1960	20
4.	Average Volume of Lumber Cut per Mill, 1946-1960	20
5.	Wholesale Prices of White Pine Lumber (1x6), 1946-1961	22
6.	Wholesale Prices of White Pine Lumber (1x12), 1946-1961	22
7.	Wholesale Price of White Pine Lumber (1x6), Adjusted to Quality of Stumpage, Compared to Prices of 1x6 Common Lumber, 1946-1961	23
8.	Wholesale Price of White Pine Lumber (1x12), Adjusted to Quality of Stumpage, Compared to Prices of 1x12 Common Lumber, 1946-1961	23
9.	Wholesale Price Indexes of White Pine Lumber (1x6) by Grades, 1946-1961	24
10.	Wholesale Price Indexes of White Pine Lumber (1x12) by Grades, 1946-1961	25
11.	Price Index Comparisons, 1946-1961	25

SUMMARY

This study was designed to describe sawmill industry changes in New Hampshire with reference to number of producing sawmills through the years 1946-1961. It is concerned with the industry's dependency on white pine as a component of the total annual cut and describes fluctuations in the total annual cut, the white pine cut, and corresponding fluctuations in sawmill movement to and from production. It acknowledges that the industry is undergoing a period of change, and that the readjustment of the industry and the causes behind this readjustment are both myriad and complex.

Beyond annual cut fluctuations and producing sawmill fluctuations, the scope of the paper was limited to include only the levels of price for both raw material and finished product at which fluctuations occurred. It is realized that the complexity and interrelation of all the factors responsible for the industry's position will not allow a complete and isolated comparison. It does show, however, the position and strength of a few factors as industry fluctuations occurred. An overall picture of the New Hampshire lumber industry can only be described by comparing the operating unit fluctuations and the price considerations discussed in this paper with further information from wide and varied sources.

The paper presents data that have been condensed and tabulated into a form readily interpreted graphically. It depended heavily on information taken from the New Hampshire Biennial Reports* and the New Hampshire Forest Market Reports to present considerations on the New Hampshire sawmill industry.

Active sawmills were tabulated each year from 1946 to 1961, and the annual cut of white pine lumber was compared with the number of active mills each year. Stumpage prices were calculated for each year, as were the changes in stumpage price from one year to the next. Lumber prices for 4 grades and 2 sizes of lumber were compiled from quotations by the Boston Commercial Bulletin. These prices by grade and size through the years, reflecting the New England price, were compared by years with both sawmill movement and stumpage prices.

The results of the study indicate that there has been a significant decline in the number of operating sawmills in New Hampshire from 1946 to 1961 and that the movement from production of a larger number of New Hampshire sawmills has not been accompanied by any significant increase in sawmill size. This conclusion is supported by the fact that there has been a decline in the annual cut of white pine lumber at a rate equal to, or greater than, the rate of decline in production units. During the sawmill movement stumpage prices for white pine have increased relatively greater and faster than lumber prices. While lumber prices have increased significantly in general, most of the increase has come in the upper grades. Typically, number 4 common lumber has shown the least change in price.

The decline in the New Hampshire sawmill industry has occurred during a period when the margin between stumpage and lumber prices has become increasingly narrower. Several other factors not covered in this paper are also felt to be causative, but the extent of their effect is unknown. The narrow margin has resulted from an adverse price-quality relationship between stumpage and the derived lumber.

* State Forestry and Recreation Commission.

The Price of White Pine Stumpage and Lumber During The Movement of New Hampshire Sawmills Into and Out of Production

By Michael R. C. Massie and Oliver P. Wallace*

I. A PROBLEM

The sawmill industry in New Hampshire has been declining in production and number of mills over the past several years. Explanations for these reductions cite loss of markets, decline in quality of the forests and price changes. No specific studies have been made of the decline but evidence of it is clear-cut in annual reports of the State Forestry and Recreation Commission.† A decline or rise in the sawmill industry is of vital importance to the state of New Hampshire. The citizens of the state whose economic welfare is dependent upon the industry, as well as public and private forestry agents who help plan for future supplies of the industry's raw material, are interested in its well-being. It seems apparent that quality of stumpage and lumber, along with the reflected price of these factors, may be a deterrent or an incentive to the operation of sawmills. An investigation of this situation should be of economic interest and concern as it describes, in part, the welfare of the state.

Since prices for white pine lumber and stumpage over time are available‡ and since price is a measure of quality, the interrelationship between price, quality and decline in white pine lumber production in New Hampshire seemed to be a logical first study. To do this, the changes in the sawmill industry situation since 1946-47 and annual fluctuations in lumber output were determined. These are then related to white pine stumpage and lumber prices over the same period.

II. REVIEW OF LITERATURE

Sawmill Changes

Hopkins (1961) indicates that the significance of the small mill in the southern lumber industry will tend to diminish. His view is that larger, more efficient mills with lower processing costs will subject them to severe competition. Lehman (1961) reports of the change in the sawmill industry in the Tennessee Valley. A study covering the period from

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‡ New Hampshire Forest Market Reports, Extension Service. The Commercial Bulletin, Boston, Massachusetts.

1950 to 1960 indicated that half the sawmills went out of business. He further reports that 80 percent of the failures were in portable mills and that the proportion of portable mills dropped from 50 to 25 percent.

In a recent address to the Northeastern Loggers' Association, Mancini (1961) reports on the lumber industry in New York State. He notes a decline of from 1500 sawmills to 1000 sawmills in the period from 1953 to 1960. Residual average mill size increased; this was the result of a lower proportion of small mills and a higher proportion of large mills.

Holland (1960a) posed the problem:

> Whether or not it will even be possible for producers of only low average quality eastern white pine lumber to pay higher prices for stumpage and still stay in business depends to a considerable degree upon how effectively this industry can hold down future production costs.

Holland (1960b) also states that the operating margin for sawmills is declining rapidly as is the number of mills operating. He stresses variable costs and the cost of labor:

> It is well known that low-grade lumber produced in small mills cutting small timber, even though investment in plant and equipment is low (or better because investment in plant and equipment is low), is still relatively costly to manufacture per thousand board feet because of high average variable costs. These mills use less capital equipment but much more labor per thousand board feet of lumber manufactured. Labor is expensive and becoming more so.

In a recent Northeast Regional Publication (1960) the position of the sawmill in New England was further clarified. It was found that:

> Year-round operation was reported by almost three quarters of the sawmills in the New England and Middle Atlantic States. However, year-round or intermittent operation of the sawmills is strongly related to size. As might be expected there was a positive correlation between size of the sawmill and the number of days in which it operated. The smallest sawmills in New England were found to be the most marginal wood-using industry in the entire Northeast, 94 percent operating intermittently and 79 percent for less than 60 days in the year.

Stoddard and House (1960) mention the reduction of sawmills in New Hampshire since 1950. They feel:

> This reflects in part the reduction in sawlog cut which has tended to squeeze out the smaller marginal operator. It also reflects the shift to larger capacity, permanent-type mills, better able to compete in price and quality with both in-state and out-of-state producers.

They report that a number of efficient medium-sized mills still exist but that a shift to larger, more efficient mills with good manufacturing and marketing facilities is a favorable trend for both the landowners and the industry. The very small mills go in and out of production rapidly. Their output is not important except locally, they are not efficient producers, and they do not sell to distant markets. Simmons (1961) indicates there are about 1200 sawmills in northern New England. About half are part-time, and the part-time mills cut only about 5 percent of the total lumber production.

Decline of Lumber Production

Zivnuska (1955) indicates that the lumber supply is decreasing and that demand is increasing in the United States. Ruttan and Callahan

(1962) show that overall lumber production and the relative price of lumber had downward trends in the 1950's. Fedkiw and Stout (1959) note an overall decline in eastern white pine lumber production. Holland (1960) comments that the supply of eastern white pine lumber has tended to decline, total demand has expanded, and lumber price has risen sharply. Stoddard and House (1961) sum up the New Hampshire situation. They state:

> . . . available evidence raises doubt that the white pine industry can operate at present cutting levels and meet the foreseeable trend in demand for quality sawlogs . . . It is interesting to note the substantial decrease in the amount of softwood species cut since 1949, due in part to increased grade requirements in the pine lumber market and decreased demand for box lumber.

Lumber Price and Quality

Holland (1960a) refers to the premium price paid for certain grades of eastern white pine lumber despite competition from quality western lumber. Wallace and Amidon (1958) found that number four common lumber presented a major selling problem in Maine and New Hampshire and was under heavy competition from substitute materials. Conversely, number three common and better lumber grades seemed inadequate to meet the demand, especially in longer lengths. Fedkiw and Stout (1959) indicate that:

> The basic problem of the industry with respect to expansion, and perhaps even maintenance of its level of output, seems to be a problem of controlling the production of No. 4 common and lower grade lumber, or of expanding the market for it without serious price concessions; or more likely, a combination of both.

They further explain (1960a) that number four common has not done as well as the upper grades. It is their belief that:

> . . . the high proportion of No. 4 common grade out-turn, 50 percent, places a serious restriction on the ability of the eastern white pine industry to expand except under extraordinary favorable market conditions.

They indicate that the prices of number three common and better lumber have risen greatly relative to the almost stable price of number four common. Number one and two common, followed by number three common, continue to have the greatest market strength. This brings them to the conclusion that:

> No matter how one looks at the trends and fluctuations in prices and production, the eastern white pine industry is strongly tied to the apron string of the market for No. 4 common lumber.

Holland (1960a) indicated that stumpage prices for eastern white pine in general continue to increase faster than lumber prices. Swain and Wallace (1956) noted the poor quality of New Hampshire stumpage by log sampling at mills. Average length was found to be 10 feet, and average diameter, small end, was found to be 9.0 inches.

Industry Readjustment

Holland (1960b) mentions three factors acting to increase logging and milling costs and to decrease supply in almost all major lumber areas. These are (1) declining availability of quality stumpage, (2) declining size and increasing taper of available sawlogs, and (3) increasing labor.

log, and related costs. The declining sawmill industry can improve its position somewhat despite low log quality according to House and Stoddard (1961). They mention several methods used to meet the problem of selling the low grades of lumber. These include paying more for better stumpage, gang mills, packaging and marketing more lumber as knotty pine panelling, and the use of small- blank-making machines for box and reel blanks. These efforts, however, do not seem to have satisfactorily increased the utility of the lower grade pine. Alternative outlets are available in some cases. Heebink (1961) notes the use of paper overlays on low-grade lumber to increase its marketability, and Milne (1961) deals specifically with the improvement of low grade white pine lumber into a marketable product by finger jointing and edge glueing.

Wallace and Amidon (1958) noted some improvements which have increased sawmill production and marketing efficiency. They recommend even better manufacture and vigorous promotion of current products. Simmons (1961) notes a modernization and efficiency increase in New England mills resulting in more accurately cut and graded lumber as well as better care in handling and drying.

Fedkiw and Stout (1959) strongly recommend quality improvement in stumpage as quickly as possible to adjust the industry to consumer demand. They note:

> . . . the output of the upper grades cannot be increased without a proportional increase in the output of the lower grades . . . insofar as the basic grade yields are fixed by the quality of timber being grown, the matter of controlling grade yields is a problem of growing better white pine timber.

They show (1960a, 1960b) how pruning can help provide better quality stumpage. Improved quality yields are obtainable through forest management and pruning, these actions being economically feasible to the timber owner.

III. DETERMINATION OF SAWMILL MOVEMENT

Sawmill Population

The New Hampshire Biennial Forestry Reports show sawmill population by year in two forms. They list the number of registered sawmills in the state each year and the total number of all mills in the state responsible for the annual cut of wood products. These yearly listings, while giving some idea of the total sawmill population, are not adequate in themselves. All registered sawmills do not necessarily have to produce in the year that they register, and, if they do, it may not be for the entire year. Also, registration did not become compulsory for all mills until 1952. The figure for all mills representing the total annual cut is correct but gives no indication of the proportion of sawmills, or of mill activity over a yearly period. Several very small mills are included which cut only a few thousand out of the millions of board feet in the total annual cut. These mills move rapidly into and out of production (often several times in any one year), and their limited production is usually fitted to personal or local demand rather than to total market demand.

The annual New Hampshire Forest Market Report lists sawmills and other wood-using plants active in buying raw material. This list shows

the sawmills in operation and indicates the kinds of timber the mills purchase. Some mills may be omitted unintentionally. Also, a few mills may own the source of all their raw material and hence are not listed as buying raw materials. The true figure of sawmill population will thus lie somewhere between those active mills given by the New Hampshire Forest Market Reports and the total mills responsible for the annual cut as shown by the New Hampshire Biennial Reports.* An exact figure is difficult to isolate. The Forest Market Report list includes all large and medium size plants and gives a minimum basis for operating sawmills. Their number by years since 1947 is shown in Table 1. The total has been broken down into portable and stationary sawmills. These figures were compiled from the names of sawmill owners listed each year in the New Hampshire Forest Market Report. It can be seen that both portable and stationary sawmills have declined from 1947 to 1961. The bigger loss has occurred in the portable mills, but the stationary sawmills have also undergone an overall decline. When the loss in total active mills is compared to registered mills and all mills representing the annual cut (Table 2), the same trend is indicated; that is, a general overall loss. In Table 3, a breakdown of the buyers of forest products is listed. The total numbers listed from 1947 to 1961 show a general decline. From the components, however, it can be seen that while sawmills have declined, buyers and loggers have increased in numbers.

Table 1. Sawmill Population in New Hampshire, 1947-1961

Year	Stationary	Portable	Total
1947			
	258*	142	400
1948			
	256*	150	406
1949			
1950	266	122	388
1951	278	125	403
1952	268	134	402
1953	259	169	428
1954	254	136	390
1955	264	115	379
1956	236	117	353
1957	241	111	352
1958	214	93	307
1959	206	73	279
1960	205	57	262
1961	185	53	238

* Figure only available for period 1947-1948, and 1948-1949.

Source — New Hampshire Forest Market Reports.

* The 1958 Census of Manufacturers (1961) lists an even more conservative figure for active sawmills in a particular year.

Table 2. Sawmill Population in New Hampshire, with Registered Sawmills, and Mills Representing the Annual Cut, 1946-1961

Year	Total Active Sawmills*	Registered Sawmills†	Mills Representing Annual Cut
1946	——	——	534
1947	400	——	743
1948	406	——	614
1949		391	598
1950	388	417	552
1951	403	438	558
1952	402	500	506
1953	428	452	477
1954	390	424	478
1955	379	409	393
1956	353	413	390
1957	352	359	357
1958	307	329	318
1959	279	308	296
1960	262	283	271
1961	238	——	——

Source — * New Hampshire Forest Market Reports.
† New Hampshire Biennial Forestry Reports.

Table 3. Buyers of Forest Products, 1947-1961

Year	Sawmills	Buyers & Loggers	Total Listing	Percent Sawmills
1947	400	23	423	95
1948	406	25	431	94
1949				
1950	388	21	409	95
1951	403	22	425	95
1952	402	24	426	94
1953	428	24	452	95
1954	390	31	421	93
1955	379	47	426	89
1956	353	62	415	85
1957	352	67	419	84
1958	307	77	384	80
1959	279	72	351	80
1960	262	86	348	75
1961	238	42	280	85

Source — New Hampshire Forest Market Reports.

Dependency Upon White Pine Stumpage

Sawmills in New Hampshire cut predominantly softwoods, as Table 4 shows. A few mills cut hardwood only; a larger number saw both hardwood and softwood; but the majority saw softwood only. This is em-

phasized in Table 5, which shows that between 64 and 74 percent of the annual cut in any year was white pine. The hardwood volume has remained about constant at 10 to 12 percent of the annual cut of lumber.

The form of raw material purchases is shown in Table 6. Stumpage purchases have declined at a faster rate than log purchases. The total percent buying stumpage alone falls between 77 and 86 percent in one year.

Table 4. Number of Sawmills Purchasing Hardwood and Softwood Logs*, 1946-1961

Year	Hardwood Only	Softwood Only	Both	Percent Using Softwood
1947				
	15	192	193	96
1948				
	8	211	187	98
1949				
1950	7	198	183	98
1951	8	197	198	98
1952	8	217	177	98
1953	8	238	182	98
1954	7	212	171	98
1955	7	206	166	98
1956	7	198	148	98
1957	6	205	141	98
1958	7	175	125	98
1959	9	149	121	97
1960	9	142	111	97
1961	9	122	107	96

* Total number of sawmills equal to the total sawmill population as shown in Table 1.

Source — New Hampshire Forest Market Reports.

Table 5. Annual Cut of Lumber by All New Hampshire Mills in M b.f., 1946-1960

Year	Hardwood	Softwood	White Pine	Total	Percent White Pine
1946	40,908	341,476	282,899	382,384	74
1947	53,636	364,357	297,654	417,993	71
1948	36,003	308,333	239,079	344,336	69
1949	28,964	261,099	184,344	290,063	64
1950	26,282	283,880	216,889	310,162	70
1951	34,011	310,321	247,732	344,332	72
1952	30,507	276,485	221,790	306,992	72
1953	25,431	262,127	209,002	287,558	73
1954	26,680	209,481	162,052	236,161	69
1955	20,350	224,779	174,473	245,129	71
1956	33,388	233,657	175,738	267,045	66
1957	24,246	191,232	154,155	215,478	72
1958	24,010	136,595	104,505	160,605	65
1959	22,683	166,687	132,109	189,370	70
1960	22,187	152,167	120,952	174,354	69

Source — New Hampshire Biennial Forestry Reports.

Table 6. Number of Sawmills Purchasing Logs and Stumpage*, 1946-1961

Year	Logs (Roadside & Delivered)	Stumpage	Both	Percent Buying Stumpage
1947	75	109	216	81
1948	85	105	216	79
1949				
1950	89	77	222	77
1951	76	82	245	81
1952	73	91	238	82
1953	66	123	239	85
1954	61	107	222	84
1955	69	87	223	82
1956	62	83	208	82
1957	51	115	186	86
1958	55	65	187	82
1959	49	47	183	82
1960	47	47	168	82
1961	45	45	148	81

* Total number of sawmills equal to the total sawmill population as shown in Table 1.

Source — New Hampshire Forest Market Reports.

IV. CHANGES IN SAWMILL PRODUCTION

A relevant hypothesis is that if the number of operating sawmills is declining, and if the annual cut is declining at a lesser rate, then the latter could mean that those mills still in production either are producing larger volumes or are the larger plants. This means that New Hampshire might have an economically sound sawmill industry producing less annual cut for quality or consumer preference reasons and having fewer, but larger and possibly more efficient sawmills. Some information is available to indicate trends that may be pertinent to this hypothesis.

Reviewing Table 1, it can be seen that the greatest decline came in portable mills. Stationary mills also show a decline, but of a lesser amount. If these remaining mills are cutting a larger average volume per mill than the all-mills average in the past, then the hypothesis is substantiated. The general decline in annual cut has been from nearly 290 thousand board feet of lumber in 1946 to 121 thousand in 1960 (Table 5). The rate of decline of the average annual cut compared to the rate of decline in producing mills will be reflected by the average volume cut per mills. Table 7, average volume cut per mill, was compiled from the total in Table 1 and Table 6 and shows the changes. It was further enlarged to include the total mills representing the annual cut as well as the active mills responsible for most of the annual cut.

From 1946 to 1960 there is an evident reduction in the average sawmill production. However, since 1954 the trend seems upward with one further sharp drop during the slack business period around 1958.

Table 7. Average Volume Cut per Mill in M b.f., 1946-1960

Year	Total Number*	Active Mills†
1946	716.1	——
1947	562.6	952.9
1948	560.8	781.3
1949	485.1	
1950	561.9	799.4
1951	617.1	854.4
1952	606.7	763.7
1953	602.8	671.9
1954	494.1	605.5
1955	623.7	646.8
1956	648.7	756.5
1957	603.6	612.2
1958	505.0	523.1
1959	639.8	678.7
1960	643.4	665.4

* Column 1. Based on the total annual cut, and the total number of mills representing the annual cut.

Source — New Hampshire Biennial Forestry Reports.

† Column 2. Based on the total annual cut, and the mills actively in production as shown by Table 1.

Source — New Hampshire Forest Market Reports.

V. PRICE RELATIONSHIPS

Stumpage Price

A range for the price of white pine stumpage is given in the New Hampshire Forest Market Reports. These ranges were listed by years in the first column of Table 8. After the O.P.A. ceiling prices were removed in 1947, the price range began to rise. The minimum price increased only three dollars while the maximum increased 17 dollars over this period 1946-61. The mid-point was used in Table 8 (column two) to show the trend in stumpage prices. In general, the price of stumpage has risen from 8 to 18 dollars per M b.f. in 13 years. A price index was also calculated for stumpage so that the relative rise in stumpage price can be compared with the relative gains in the wholesale price of lumber. This index is shown in column three.

Wholesale Price Indexes

Three standard wholesale price indexes were used in the comparison of relative changes in price. These are shown in Table 9. The national wholesale price index for lumber has not followed the trend of the indexes for all commodities or the "all-commodities less farm produce." Especially noticeable is the greater yearly fluctuation in the relative price of lumber.

Table 8. Price and Price Index for White Pine Stumpage in New Hampshire in Dollars per M b.f., 1946-1961

Year	Range	Mid-Point	Index (1947–1949=100)
1946*	6–10	8	87
1947*	6–10	8	87
1948	5–15	10	109
1949	4–15	9.5	103
1950	5–15	10	109
1951	6–20	13	141
1952	7–21	14	152
1953	8–22	15	163
1954	8–22	15	163
1955	8–22	15	163
1956	9–24	16.5	179
1957	9–26	17.5	190
1958	8–30	19	207
1959	5–30	17.5	190
1960	6–30	18	196
1961	9–27	18	196

* Price set by O.P.A.

Source — New Hampshire Forest Market Reports.

Table 9. Wholesale Price Indexes (1947-1949=100), 1946-1961

Year	All Commodities	All Commodities other than Farm Produce & Food	All Lumber
1946	78.7	78.3	——
1947	96.4	95.3	94.5
1948	104.4	103.4	107.3
1949	99.2	101.3	98.2
1950	103.1	105.0	114.5
1951	114.8	115.9	123.6
1952	111.6	113.2	120.5
1953	110.1	114.0	119.3
1954	110.3	114.5	117.3
1955	110.7	117.0	124.4
1956	114.3	122.2	127.2
1957	117.6	125.6	119.7
1958	119.2	126.0	118.0
1959	119.5	128.2	127.1
1960	119.6	128.3	121.4
1961	119.1	127.7	115.4

Source — Handbook of Basic Economic Statistics

Wholesale Prices of White Pine Lumber

The wholesale price of white pine lumber was compiled for two sizes and four grades. These prices are shown in Table 10. They are the prices

Table 10. Wholesale Prices of White Pine Lumber by Size and Grade per M b.f., 1946-1961

Year	1x6				1x12			
		Commons				Commons		
	Ds&b*	1&2	3	4	Ds&b*	1&2	3	4
1946	$ 81	$ 63	$ 57	$ 53	$101	$ 75	$ 65	$ 55
1947	103	87	79	68	130	102	89	71
1948	131	101	89	77	158	113	99	80
1949	143	109	88	71	186	126	96	79
1950	179	124	96	76	217	135	103	82
1951	220	134	102	90	243	146	110	94
1952	220	134	103	87	235	145	113	89
1953	223	140	110	87	231	155	118	92
1954	224	144	113	82	232	157	121	87
1955	226	151	121	84	239	164	128	87
1956	237	160	124	90	259	173	131	91
1957	233	167	126	89	256	182	133	91
1958	233	170	126	86	261	181	138	85
1959	219	168	119	87	263	187	140	88
1960	219	164	116	87	266	187	131	90
1961	235	171	131	92	283	193	144	103

* D select & better.

Source — Commercial Bulletin (Quotations) Boston, Mass.

of 4/4, dried, surfaced, white pine lumber, f.o.b. mill. Two sizes were used for representation because of price differences according to width. The narrower 1 x 6 boards are more liable to price fluctuations than the wider 1 x 12 boards. The prices given in the table are yearly average prices for each size and grade. The center points of the ranges given in the first issue for each quarter of The Commercial Bulletin under "Quotations" were averaged to obtain the yearly price. This was done for the years 1946 through 1961. These average yearly prices are based on quotations which focus the New England wholesale price for white pine lumber. The general price trend has shown an increase up through the years. It can be noticed, however, that the greatest change comes in the higher grades.

Wholesale Price Indexes for White Pine Lumber

The wholesale price indexes for white pine lumber are shown in Table 11. They were derived from Table 10 by equating the base years 1947-1949 to 100 for each grade in the two sizes and calculating the relative change in price from this base. They serve to amplify the changes in price indicated in Table 10. A significant overall rise in prices is noted and the higher the grade in either size class the higher the rise in price from 1946 to 1961. It is noticeable that in the early years, namely 1946-1948, all grades increased in price at relatively the same rate. The period 1948-1951 saw a continued rise but an irregular rate. From 1951 on a general leveling trend can be observed.

Wholesale Prices and Wholesale Price Indexes, Adjusted

In order to show a wholesale price and relative change in price for lumber as it comes from the sawmill, the wholesale prices and their indexes must be adjusted. This adjusted price of lumber will reflect the revenue received by a mill. A considerable portion of all lumber sold by New Hampshire mills is sold wholesale.*

The average quality of New Hampshire stumpage has shown little marked improvement since the last days of the virgin cut. There is only limited factual data to support this general forestry opinion, but assuming little real improvement between 1946 and 1961, a pertinent study by Wallace and Amidon (1958) † gives accurate data on the quality of white pine stumpage. Their study found the average log quality in New Hampshire to saw out 4 percent D select and better, 13 percent number 1 and 2 common, 38 percent number 3 common, and 45 percent number 4 and 5 common.‡ These figures show that sawmills in New Hampshire do not produce large quantities of the highest priced lumber. It would, of course, be natural for them to produce as much high quality and high priced lumber as they could, but on the average their grade recovery should be in line with the above percents. This means that the wholesale price they received per M b.f. of lumber will be 4 percent of the price received for D select and better, 13 percent of the price received for number 1 and 2 common, 38 percent of the price received for number 3 common and 45 percent of the price received for number 4 and 5 common. The figures in this paper can then be adjusted on this basis to reflect sawmill price, in effect, an actual yard-run wholesale price based on what the mills produce. To keep the price figures on the conservative side it should be understood that the 45 percent number 4 and 5 common is entirely number 4 common. This eliminates the poorest grade and will leave the adjusted price received by the mills at as high a level as is conceivably possible in the actual situation.

Table 12 gives these adjusted prices and the adjusted indexes to reflect the relative changes in price. It can be seen by comparison with Table 11 that both the adjusted price and the adjusted index fall between number 3 and number 4 common lumber. The effect of this trend should be of special interest when considering the effect of lumber prices on producing mills. Marketing studies indicate, also, that number 3 common is considered as medium quality lumber and that number 4 common lumber is poor quality material with only limited demand. Another important factor should not be overlooked; that the average price of ungraded or mill run lumber is approximately equivalent to the price for number 4 common lumber. Unpublished mill studies

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* Wallace and Amidon (1958) indicate that this figure might be as high as 70 percent.

† They derived the grade recovery for the 1956 annual cut. Their sample was based on 75 million feet to separate grades D select and better, number 1 and 2 common, and number 3 common and poorer. A 15 million bd. ft. sample separated number 3 common from number 4 and number 5 common.

‡ The Executive Secretary of the Northeastern Lumber Manufacturers' Association, following a check with industry in 1955, has estimated average quality of stumpage as D select and better, 3 percent; number 1 and 2 common, 12 percent; number 3 common, 25 percent; number 4 common and poorer, 50 percent (Holland, 1960).

for 1959-1960 in New Hampshire strongly suggest that this is true throughout the industry.

Table 11. Wholesale Price Indexes of White Pine Lumber by Size and Grade per M b.f.*, 1946-1961

Year	1x6				1x12			
		Commons				Commons		
	Ds&b	1&2	3	4	Ds&b	1&2	3	4
1946	65	64	67	74	64	66	68	71
1947	82	88	93	94	82	89	94	92
1948	104	102	105	107	100	99	104	104
1949	113	110	104	99	118	111	101	103
1950	142	125	113	106	137	118	108	106
1951	175	135	120	125	154	128	116	122
1952	175	135	121	121	149	127	119	116
1953	177	141	129	121	146	136	124	119
1954	178	141	133	114	147	138	127	113
1955	179	153	142	117	151	144	135	113
1956	188	162	146	125	164	152	138	118
1957	185	169	148	124	162	160	140	118
1958	185	172	148	119	165	159	145	110
1959	174	170	140	121	166	164	147	114
1960	174	166	136	121	168	164	138	117
1961	187	173	154	128	179	169	152	134

* D select & better.
* Compiled from Table 10. (Base year 1947-1949 equal 100)

Table 12. Wholesale Prices and Indexes Adjusted to Quality of Stumpage per M b.f.*, 1946-1961

Year	Price 1x6	Price 1x12	Index 1x6	Index 1x12
	dollars			
1946	$ 57	$ 63	70	69
1947	76	84	92	92
1948	87	95	106	103
1949	85	96	103	104
1950	94	102	112	110
1951	106	113	126	122
1952	104	111	125	120
1953	108	116	129	124
1954	108	115	127	123
1955	112	119	134	127
1956	118	124	140	132
1957	119	125	141	134
1958	118	124	140	132
1959	115	128	137	135
1960	113	125	135	133
1961	123	138	146	147

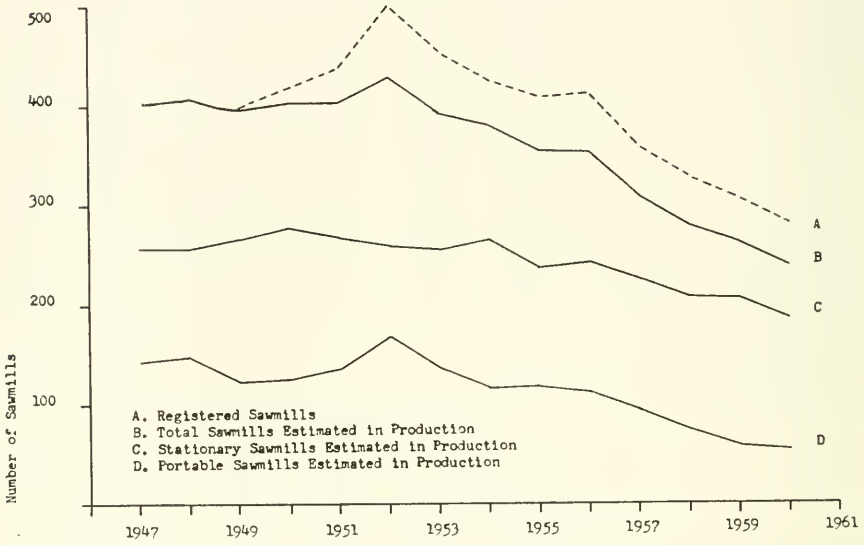
* Compiled from Tables 10 and 11.

VI. RESULTS

Sawmill Movement

Figure 1 shows the overall decline in sawmill numbers since 1947. Curves C and D, Stationary Sawmills and Portable Sawmills Estimated in Production, respectively, show a similar decline, although the portable mill numbers show more fluctuations. Actually a total of 190 producing mills dropped out of operations from 1953 to 1961, including 74 stationary and 116 portables.

Fig. 1. Sawmill Population in New Hampshire, 1947-1961

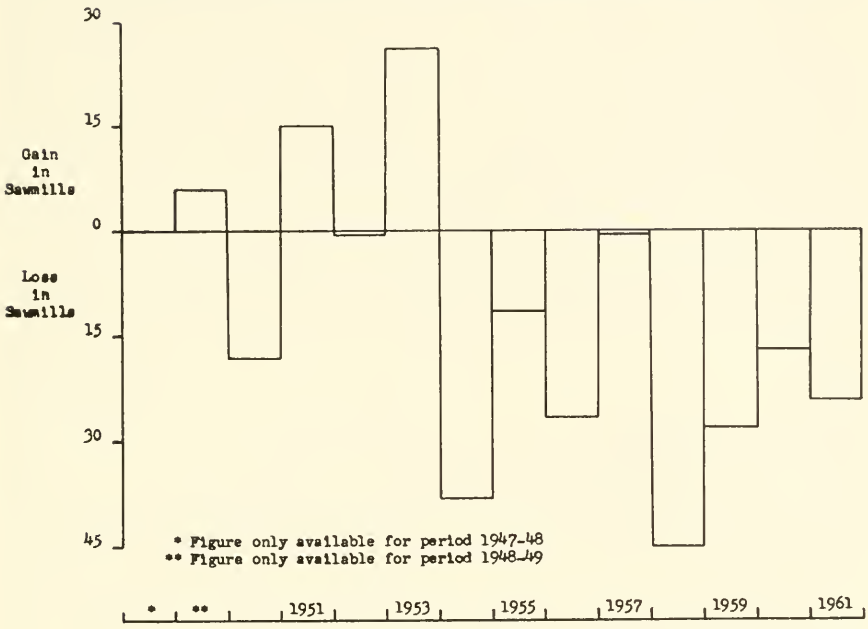


Considering the movement of sawmills to and from production over the years on the basis of estimated mills in production each year, a noticeable trend is shown by Figure 2. From 1946 to the end of 1952 there was considerable fluctuation but a general movement to production, the mills increasing from 400 in 1946 to 428 at the start of 1953. By referring again to Figure 1 it can be seen that this gain was in portable mills. One stationary mill came into operation together with 27 portable mills. From 1953 to 1961 there was a consistent movement of both portable and stationary mills out of production. While both declined, the greater loss was 116 portable mills as compared to 74 stationary mills. During this movement, two years showed a decline only in portable mills, the total decline being offset by a movement into production of 10 stationary mills in 1954 and 5 stationary mills in 1956. This leaves an overall decline, but to a much lesser degree in stationary mills.

Sawmill Size

The average size of New Hampshire sawmills can be derived from the volume of lumber cut annually and the number of sawmills in operation.

Fig. 2. Movement of Sawmills in New Hampshire Into and Out of Production, 1947-48 to 1961 (1947-48, 400 mills to 1961, 238 mills)



The annual cut (Table 6) indicates that from 1946 to 1960 from 64 to 74 percent of all lumber produced in the state was white pine. This extremely heavy dependency upon white pine by the industry means that the average mill in New Hampshire, even considering the total cut, depends mainly upon white pine for lumber. The total annual cut divided equally among the number of mills in operation each year will give an accurate average sawmill size for New Hampshire. It follows that this size is dependent on white pine.

In Figure 3 the total volume (hardwoods and softwoods) cut and the white pine cut have been graphed. The total cut in each case shows a relatively constant decline. If the total annual cut each year is divided by the total operational sawmills each year, a graphic line can be shown representing the average volume cut per mill per year. This line, or more correctly the slope of a straight line running through the collection of points forming the average volume cut per mill line, will indicate an overall decrease or increase in sawmill size. The average volume of lumber cut per mill based on line B and Figure 4 graphically represents a yearly change in sawmill size for all mills representing the annual cut. When this line is smoothed mathematically so that a trend line may be drawn,* a very slight positive trend line can be shown. Line B does not consider the fact that a fairly large number of the sawmills in New Hampshire produce only a very small amount of the annual cut.

* Trend lines were substantiated by using the curve smoothing method shown by Scarborough (1958, Chapter 16, pp. 489-495).

Fig. 3. Total Annual Cut of Lumber for New Hampshire, 1946-1960

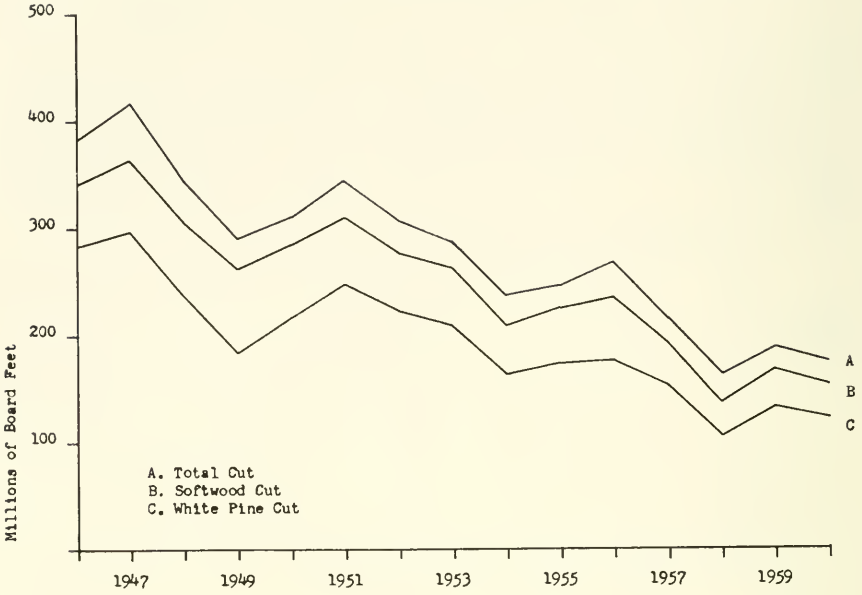
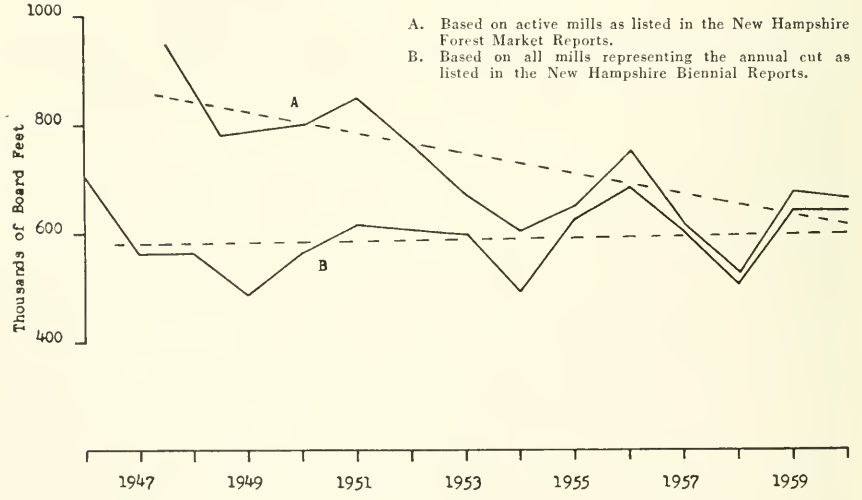


Fig. 4. Average Volume of Lumber Cut per Mill, 1946-1960



As suggested by Simmons (1961), this can run as high as 50 percent of the mills responsible for 5 percent of the annual cut. For this reason only actively producing mills were used to formulate a trend line for average volume cut per mills by years. Line A, based on active mills represents the average volume cut per mill by years for all the actively producing mills in the state. It omits several small part-time mills pro-

ducing a relatively negligible amount of the annual cut. Again using the smoothing process a very distinct and negative trend line occurs. This trend line then indicates that the average volume cut per mill per year in New Hampshire is declining rapidly. This is not proof-positive that all mills are getting smaller.* It does however, indicate that all mills, or even the majority of mills, are not getting larger. If the majority of mills were getting larger, the minority of mills remaining would have to produce a very small amount to cause a trend line such as that based on active mills (A). While the total number of mills has declined, stationary mills have declined at a substantially slower rate than portable mills. Some of the former are known to have become larger and more efficient. This factor considering the trend line, has resulted in reduced production for several of the remaining mills. It would be highly probable that the greatest loss in production occurred at portable mills.

Lumber Price

Price comparisons are being made on a basis of square edge, graded lumber. It is known that a considerable portion of the lumber manufactured in New Hampshire is sold both mill run and round edge. Evidence is limited but Wallace and Amidon (1958) found that round edge was losing ground to square edge. The former has declined from 63 percent of the white pine lumber cut in 1925 to 43 percent of the cut in 1956. They indicate that small producers prefer to sell mill run to manufacturers or wholesalers and that a yearly production of close to half a million feet is necessary to make standard grading practicable. The mills dependent on ungraded lumber are mostly small and sell to local markets. The price is comparable to number 4 common and they move rapidly to and from intermittent production depending on their local markets.

It is entirely possible that much of the decline in sawmills is due to a movement of mills from production when markets such as the box industry disappear. Sales of round-edge and the lower grades of lumber by larger mills offer stiff competition to the smaller sawmills, especially when the operating margin of the smaller mills is decreased by the lack of income returns from grading. In other words, the operating margin without the benefit of increased income from grading would be extremely narrow. The extent of this margin cannot be clearly defined but changes in grade prices will indicate changes in margin.

Figure 5 shows the price trends in four grades of white pine 1 x 6 boards from 1946 to 1961. Grading and price reflect definite trends. D select and better rose rapidly to a premium price in 1951. Since then there has been only a slight general increase. Number 1 and 2 common and number 3 common have risen continually and steadily from 1946 to 1961, showing not only a steady rise in price, but a distinct trend of continual gain. Number 4 common rose slightly and somewhat erratically to a price of approximately 90 dollars per M b.f. in 1951 and then stopped. There has been no significant price change since that time.

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* It would be impossible to consider all sawmills in the state as getting smaller. Both written and visual evidence indicate several large and efficient mills are in operation.

Fig. 5. Wholesale Prices of White Pine Lumber (1x6), 1946-1961

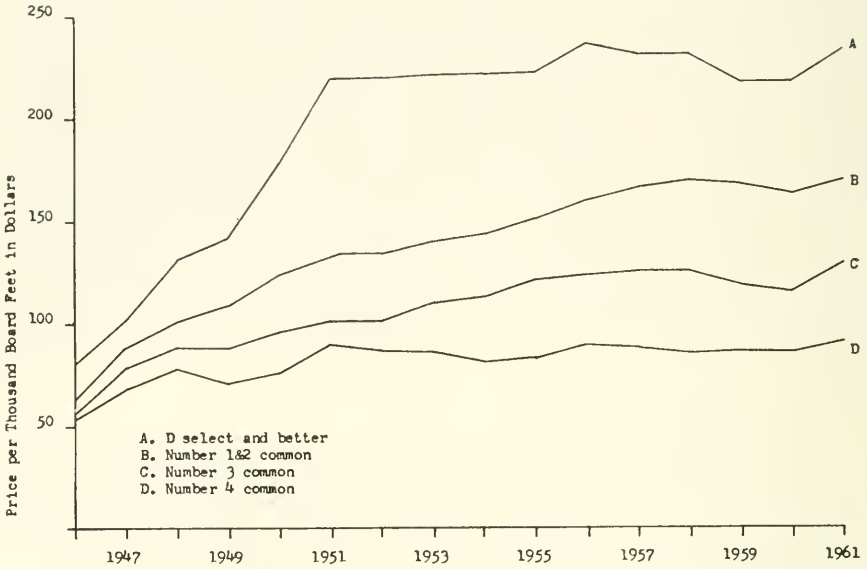
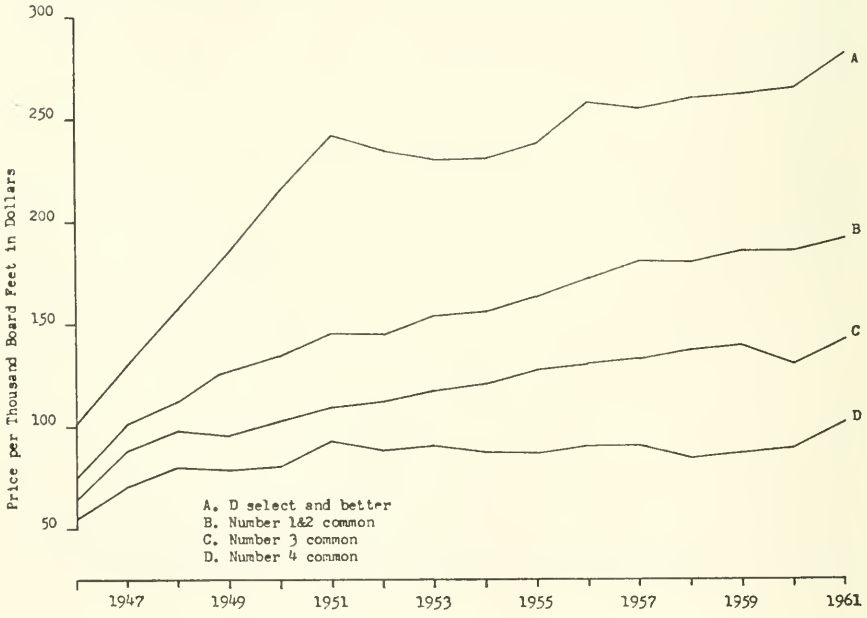


Fig. 6. Wholesale Prices of White Pine Lumber (1x12), 1946-1961



In Figure 6, using 1 x 12 instead of 1 x 6, the pattern is similar with two possible exceptions; one, a very sharp increase to 1951 in D select

and better prices followed by a slower but still upward advance from 1951 to 1961. The number 4 common prices rose moderately to 1951 and then leveled off. The second exception is in 1958 when a slight upward trend in curve D occurred, and which strengthened slightly in 1960.

Figure 7 shows the wholesale price of 1 x 6 boards when adjusted to average log quality available in New Hampshire. The wholesale price

Fig. 7. Wholesale Prices of White Pine Lumber (1x6), Adjusted to Quality of Stumpage, Compared to Prices of (1x6) Common Lumber, 1946-1961

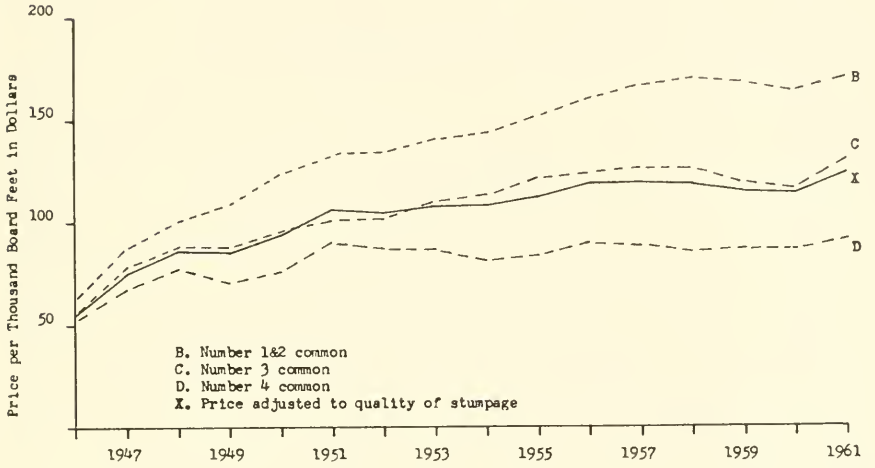
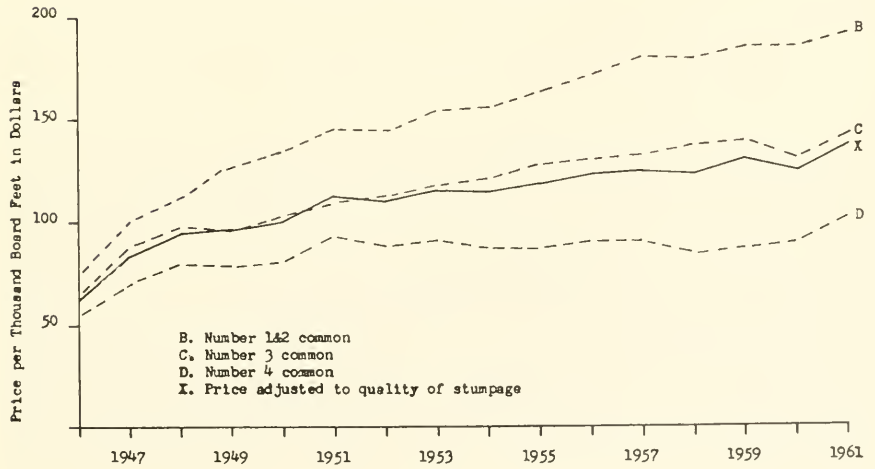
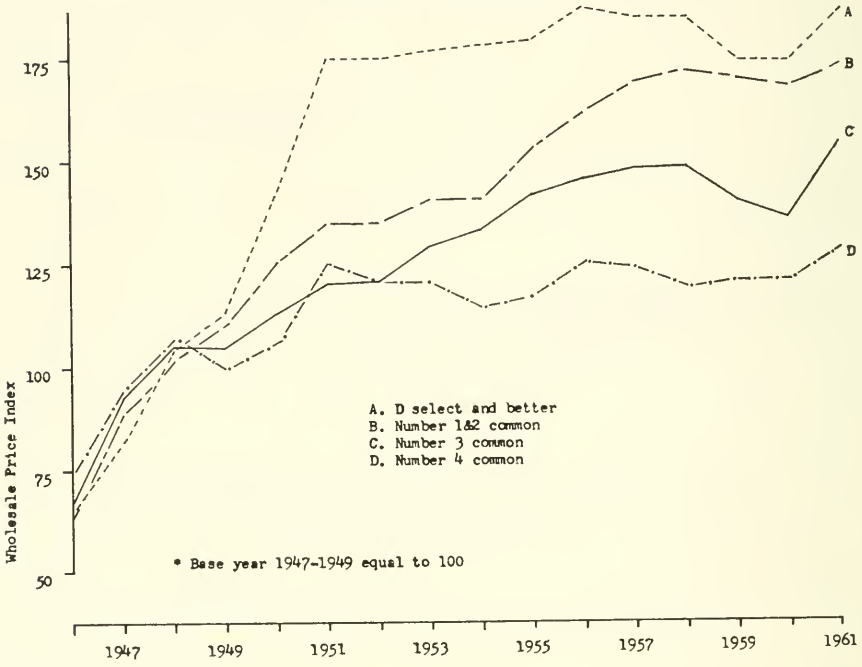


Fig. 8. Wholesale Price of White Pine Lumber (1x12), Adjusted to Quality of Stumpage, Compared to Price of (1x12) Common Lumber, 1946-1961



of grades 1, 2, 3 and 4 common is given for comparison. It can be seen that the adjusted price generally falls slightly below number 3 common. If mill run and ungraded lumber approximate the price for number 4 common, mills that grade have a slight but increasing advantage in revenue. It may not be practical for small mills to grade their small volume. The larger mills, however, should be able to cover the cost of grading. This should increase their revenue per unit of volume by the difference between trend lines D and X, Figure 7. This margin has steadily increased from 1946 to 1961 and now represents an increase of approximately 30 dollars per M b.f. Figure 8 shows the same situation but for 1 x 12 boards.

Fig. 9. Wholesale Price Indexes of White Pine Lumber (1x6)*, by Grades, 1946-1961



A trend of rising prices has been established. Of further interest, however, are the rates relative to each other at which the noted grades of lumber have risen in price. As can be seen by Figure 9, the wholesale price indexes for 1 x 6 lumber show very definite trends. D select and better rose much faster than the other grades before 1951. Number 4 common shows the least rate of increase and has shown a general trend of almost no increase since 1951. Figure 10 depicts the same situation for 1 x 12 lumber. The wider board, however, does not follow exactly the pattern indicated by the narrower 1 x 6 lumber. Here, D select and better index rose very rapidly to 1951, declined slightly, and then rose slowly but steadily in comparison to the other grades. Number 1, 2 and 3 common 1 x 12 lumber indexes rose steadily and rapidly. Number 4

Fig. 10. Wholesale Price Indexes of White Pine Lumber (1x12)*, by Grades, 1946-1961

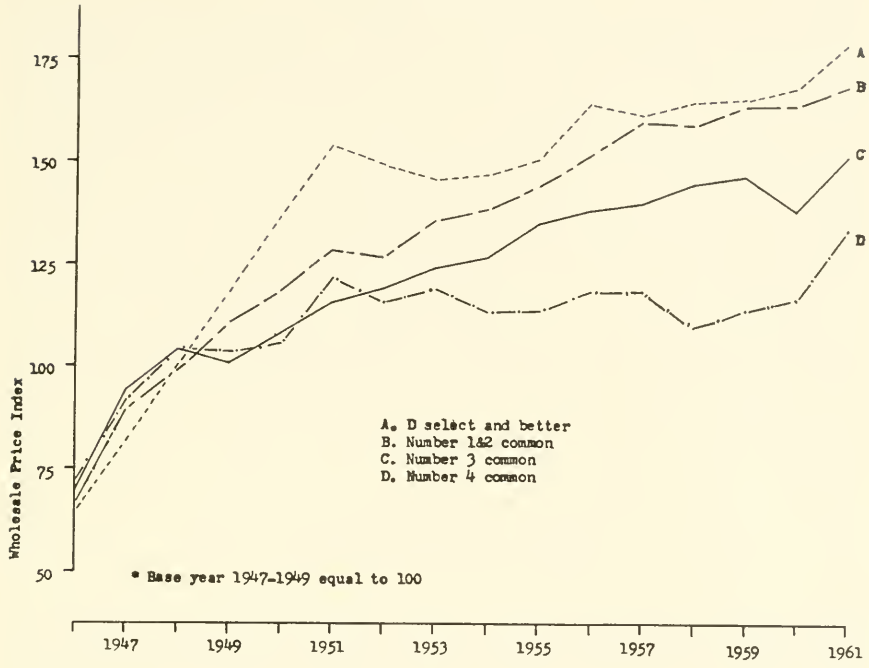
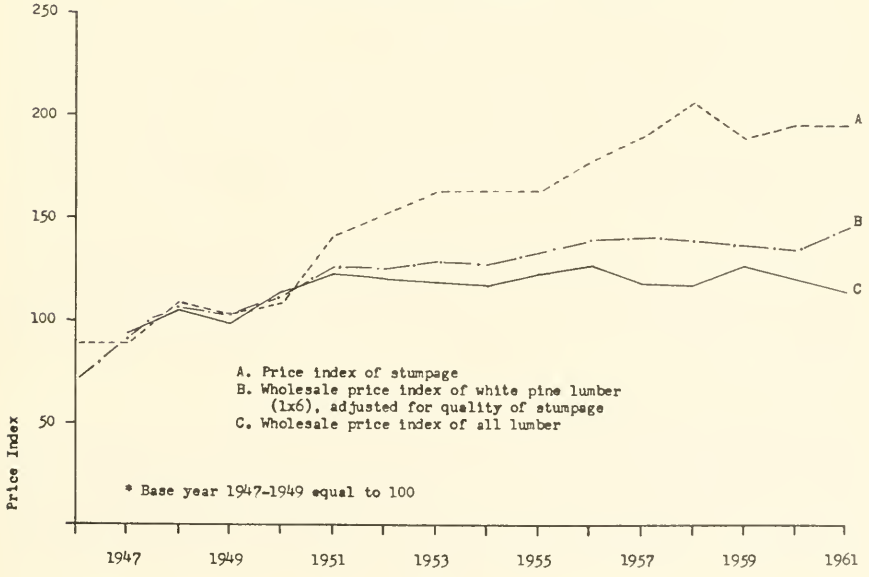


Fig. 11. Price Index Comparisons*, 1946-1961



common 1 x 12 lumber rose sharply until 1951 compared to the other grades. A leveling off period followed, but 1960 showed a definite sharp upturn in the relative price.

The relative change of the price of lumber, adjusted to the quality of stumpage, can also be shown by wholesale price index comparisons. Both 1 x 6 and 1 x 12 lumber followed similar trends. That is, the relative change in price falls slightly below number 3 common but well above number 4 common. Figure 11 shows the price index for 1 x 6 lumber in comparison to the national wholesale price index of lumber and the price index for stumpage. It can be seen that the adjusted price of eastern white pine lumber enjoys a slight advantage over all lumber in price increases since 1946. The price index for stumpage has risen very sharply and steadily. It compares closely with the steady rise of the indexes for grades 1, 2 and 3 common (Figures 9 and 10). It is far above the index for the adjusted price of all lumber, Figure 11. This rise in price of the industry's raw materials at a much faster rate than the price for lumber has reduced the industry's operating margin.

VII. CONCLUSIONS

Sawmill Movement and Size

The sawmill industry has undergone a period of decline in terms of both production units and volume of lumber cut from 1946 to 1961. A decline in the number of sawmills was noted for total mills representing the annual cut, for registered mills, and for active sawmills. The largest decline in active sawmills occurred to portable mills, but stationary mills also had a decline. Operating mills declined from 400 in 1946 to 238 in 1961. The major period of decline, however, was from 1953 to 1961 when active sawmills decreased from 428 to 238 mills without even one yearly increase or movement into production. This loss amounts to 44 percent of the industry's production units. The annual cut of lumber in New Hampshire, and more particularly the white pine cut, has shown a significant decline. The cut of white pine lumber has decreased from almost 283 million feet in 1946 to about 121 million feet in 1961, a decline amounting to 57 percent.

The annual cut is evidently decreasing at a rate greater than the rate at which sawmill numbers are decreasing. This means that for the industry in general the mills are not becoming larger, and average mill size is decreasing despite actual production increases by a few individual mills.

The Margin Between Stumpage and Lumber Prices

The wholesale prices of eastern white pine lumber have been established by market demand since the removal of the O.P.A. ceiling prices in 1946. Sawmills in order to move into operation, or stay in operation, must receive enough revenue from selling lumber to cover their cost of operation, pay for their raw materials, and return them a profit. Sawmill

operation is then dependent upon three factors:* (1) the price of lumber reflecting mill revenue, (2) the price of raw materials, or stumpage, and (3) the margin between the previous two factors composed of total operating costs and profit. Information is not available on operating costs and advantages gained by efficiency. It is assumed for individual units that operating costs are known.

The upper limits of the margin over costs are set by the market prices. Thus the individual mill has a set margin; and if that margin becomes increasingly narrower, operating costs and profits must be lowered or compressed. Advantages in mill efficiency immediately become obvious. If a point is to be reached where operating costs exclude profits, this point should be reached first by the least efficient mills. It follows that the narrower the margin becomes, the greater is the possibility of inefficient sawmills moving out of production.

Lumber prices in general have steadily increased. The greatest relative change came in number 1, 2 and 3 common grades. D select and better has shown a slight leveling trend in comparison to number 1, 2 and 3 common grades over the past few years. Number 4 common, although still showing a rise in price, has been almost level compared to the other grades. It rose rapidly to a price of approximately 90 dollars per M b.f. in 1951 and has remained at about this level since that time. The wholesale price of lumber adjusted to average quality of stumpage is well above number 4 common but below number 3 common grade.

There has been a steady increase in the price of stumpage since 1946 amounting to well over 100 percent. The midpoint of the price range offered for stumpage in New Hampshire in 1961 was approximately 18 dollars per M b.f. as compared with the O.P.A. price of 8 dollars per M b.f. in 1946. The change in the price of stumpage has been faster and the price is relatively higher, when compared on an index basis, than lumber prices.

In effect, for the majority of sawmills in New Hampshire, the margin between the cost of raw material and the revenue from lumber production has steadily decreased. This has been caused by a greater increase in the price of stumpage relative to the rate of increase in the adjusted price of lumber. It is important to note that the higher grades of lumber have shown strong price increases, and it is the lower grades that do not show significant increases. The adjusted price, then, has been reduced by the large percentage of low grade lumber produced and sold at a low price (Wallace and Amidon, 1958).

The decline of the sawmill industry in New Hampshire, in both producing units and production over the past several years, has occurred during a period when the margin between stumpage prices and lumber prices has declined. The effect of operating costs, efficiency, and the availability of markets is not known. It is felt, however, that these factors

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* Two other related factors and their effect must be noted at this point. These are the availability of stumpage and the size of the market for eastern white pine lumber.. The relative scarcity or abundance of these two factors within the industry will be reflected by price and hence is pertinent to this paper. Absolute scarcity of stumpage or lack of markets for lumber, however, is not covered in this paper and their effect on sawmill operation or production is not considered. It is entirely possible that this could be responsible in part for the decline in the lumber industry.

are related to the decline, and that they have had some causative effect. The narrowing margin has definite quality implications. High quality lumber is selling at a higher price relatively than low quality lumber. All qualities of lumber produced in New Hampshire are from stumpage that is not rising in general quality despite a sharp rise in its price over the past several years.

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The price of white pine stumpage and lumber during the movement of New Hampshire sawmills into and out of production.

Since 1950 there has been a steady decline of sawmill numbers, principally portables. During this same period the relative price index of white pine stumpage, which comprises 70 percent of their annual volume, has risen faster than the relative price index of lumber. In addition, other factors such as decline in stumpage quality and the box board market contributed to this decline.

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